

WHAT IS CLAIMED IS:

1. A polypeptide comprising a sequence selected from the group consisting of:
 - (a) a GDNFR α extracellular domain amino acid sequence;
 - (b) an allelic variant or mammalian homolog of (a);
 - 5 (c) a sequence encoded by nucleic acid which hybridizes under stringent conditions to a nucleic acid encoding (a) or (b); and
 - (d) a sequence derived from (a) or (b) by substitution, deletion, or addition of one or several amino acids in the amino acid sequence of (a) or (b).
2. The polypeptide of Claim 1, comprising the amino acid sequence of GDNFR α ECD from
10 SEQ ID NO: 2.
3. The polypeptide of Claim 2, comprising the amino acid sequence of mature GDNFR α from
SEQ ID NO: 2.
4. The polypeptide of claim 3, which specifically binds GDNF.
5. The polypeptide of claim 4, which is conjugated with, or fused to, a molecule which increases
15 the serum half-life thereof.
6. The polypeptide of claim 1 that is soluble GDNFR α .
7. A composition comprising the polypeptide of claim 1 and a physiologically acceptable carrier.
8. The polypeptide of claim 1 that is chimeric GDNFR α .
- 20 9. The chimeric GDNFR α of claim 8, comprising a GDNFR α amino acid sequence fused to an immunoglobulin sequence.
10. The chimeric GDNFR α of claim 8, comprising a GDNFR α amino acid sequence fused to an epitope tag sequence.
11. A method for identifying a molecule which binds to the GDNFR α , comprising exposing the
25 GDNFR α to the molecule suspected of binding thereto and determining binding of the molecule to the GDNFR α .
12. The method of claim 11, wherein the GDNFR α is soluble GDNFR α .
13. A method for identifying a molecule which activates GDNFR α , comprising exposing the GDNFR α to a molecule suspected of being capable of activating GDNFR α and measuring activation of
30 GDNFR α .
14. A method for purifying a molecule which binds to GDNFR α , comprising adsorbing the molecule to GDNFR α immobilized on a solid phase and recovering the molecule from the immobilized GDNFR α .
15. The method of claim 14 wherein the GDNFR α is chimeric GDNFR α , comprising a fusion
35 of a GDNFR α extracellular domain sequence to an immunoglobulin constant domain sequence.
16. An antibody that specifically binds to GDNFR α of claim 1.
17. The antibody of claim 16, which is a monoclonal antibody.
18. A composition comprising the antibody of claim 17 and a physiologically acceptable carrier.

19. The composition of claim 18 further comprising a cytokine or a neurotrophic factor.
20. A method for activating GDNFR α , comprising exposing GDNFR α to an amount of an agonist antibody of claim 16 which is effective for activating GDNFR α .
21. A method for modulating a physiological response of a cell to GDNF, comprising contacting
5 the cell with an amount of a GDNFR α effective for modulating the response of the cell to GDNF.
22. A method for determining the presence of GDNFR α , comprising exposing a test sample suspected of containing the GDNFR α to the antibody of claim 16 and determining binding of said antibody to the test sample.
23. A nucleic acid molecule comprising a nucleic acid sequence encoding GDNFR α of claim
10 1.
24. The nucleic acid molecule of claim 23, further comprising a promoter operably linked to the nucleic acid molecule.
25. The nucleic acid molecule of claim 23, wherein the nucleic acid sequence encodes GDNFR α ECD.
26. The nucleic acid molecule of claim 23, wherein the nucleic acid sequence encodes chimeric
15 GDNFR α .
27. An expression vector comprising the nucleic acid molecule of claim 23 operably linked to control sequences recognized by a host cell transformed with the vector.
28. A host cell comprising the vector of claim 25.
29. A nucleic acid comprising a nucleic acid sequence of at least 18 contiguous nucleotides from
20 GDNFR α .
30. A process of using a nucleic acid molecule encoding GDNFR α to effect production of GDNFR α , comprising culturing the host cell of claim 28 under conditions allowing expression of GDNFR α .
31. The process of claim 30 further comprising recovering the GDNFR α from the host cell
25 culture.
32. A non-human, transgenic animal which contains cells that express nucleic acid encoding GDNFR α polypeptide.
33. A non-human, knockout animal which contains cells having an altered GDNFR α gene.
34. A method of treating kidney disease, comprising administering to a patient in need of
30 treatment a therapeutically effective amount of GDNF or GDNF agonist.
35. The method of claim 34, wherein the GDNF is human GDNF.
36. The method of claim 34, further comprising administration of GDNFR α .
37. The method of claim 34, wherein the kidney disease is associated with glomerulonephritis.
38. A method of treating an enteric nervous system-related disorder, comprising administering
35 to a patient in need of such treatment a therapeutically effective amount of GDNF or GDNF agonist.
39. The method of claim 38, wherein the GDNF is human GDNF.
40. The method of claim 38, further comprising administration of GDNFR α .